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PROCEEDINGS
OF
THE ROYAL SOCIETY.

1837.

No. 30.

November 16, 1837.

FRANCIS BAILY, Esq., V.P. and Treasurer, in the Chair,

“ Description of a new Barometer, recently fixed up in the Apartments of the Royal Society ; with remarks on the mode hitherto pursued at various periods, and an account of that which is now adopted, for correcting the observed height of the mercury in the Society’s Barometers.” By Francis Baily, Esq., Vice-President and Treasurer, R.S.

The barometer, here alluded to, may in some measure be considered as two separate and independent barometers, inasmuch as it is formed of two distinct tubes dipping into one and the same cistern of mercury. One of these tubes is made of *flint* glass, and the other of *crown* glass, with a view to ascertain whether, at the end of any given period, the one may have had any greater chemical effect on the mercury than the other, and thus affected the results. A brass rod, to which the scale is attached, passes through the framework, between the two tubes, and is thus common to both : one end of which is furnished with a fine agate point, which, by means of a rack and pinion moving the whole rod, may be brought just to touch the surface of the mercury in the cistern, the slightest contact with which is immediately discernible ; and the other end of which bears the usual scale of inches, tenths, &c. ; and there is a separate vernier for each tube. A small thermometer, the bulb of which dips into the mercury in the cistern, is inserted at the bottom : and an eye-piece is also there fixed, so that the agate point can be viewed with more distinctness and accuracy. The whole instrument is made to turn round in azimuth, in order to verify the perpendicularity of the tubes and the scale.

It is evident that there are many advantages attending this mode of construction, which are not to be found in the barometers as usually formed for general use in this country. The absolute heights are more correctly and more satisfactorily determined ; and the permanency of true action is more effectually noticed and secured. For, every part is under the inspection and control of the observer ; and any derangement or imperfection in either of the tubes is immediately detected on comparison with the other. And, considering the care that has been taken in filling the tubes, and setting off the

scale, it may justly be considered as a *standard barometer*. The present volume of the *Philosophical Transactions* will contain the first register of the observations that have been made with this instrument.

Mr. Baily then enters into a description of the several corrections that are required for the various kinds of barometers, in order to make them comparable with one another ; and treats of each of these in their order. First as to the correction for temperature, both of the mercury and of the scale ; next for capillarity ; and afterwards for the height of the barometer above the level of the sea. A table is given for the first of these corrections ; and a convenient formula for the latter : the correction for capillarity is constant, and of very small magnitude.

The author next describes the mode in which the observations of the barometer have, from time to time, been recorded in the Meteorological Journal of this Society ; and points out several inaccuracies which have occasionally been committed in this department, for want of an uniform plan of reduction. Now this state of confusion and uncertainty he remarks ought not to exist in a meteorological journal emanating from this Society, more especially as the true values are as easily attainable as the approximate ones. And although, in a general point of view, the minute differences caused by such errors may be unimportant, yet as appeals are frequently made to the barometer of this Society, as a standard, by persons engaged in important researches, the most scrupulous accuracy ought to be adopted and pursued, and the fullest explanation placed on record. And Mr. Baily says that notwithstanding the details which he has given may create some doubt respecting the accuracy of the past, yet he is persuaded that the system now pursued will inspire more confidence for the future. It is on this account that he has entered thus at large on the subject ; trusting that what he has stated will not only tend to preserve for the future a more correct and uniform system, but also justify the Council in directing that the register should henceforth contain the daily observations *uncorrected*, and thus prevent the possibility of any similar confusion and mistakes hereafter.

Mr. Baily then adverts to the height of the Society's barometer above the mean level of the sea ; a subject of much interest to many persons engaged in various pursuits, but which appears, from the notes attached, at different periods, to the meteorological journal of this Society, to be involved in some confusion and uncertainty. Thus, prior to the year 1823, the cistern of the barometer is said to be 81 feet above the level of low-water spring tides at Somerset House ; but without any information how this was connected with the sea. From 1823 to 1825, both inclusive, it is said to be 100 feet above the same level. And from 1826 to 1836, both inclusive, the above indication is omitted, and the height is said to be 83 feet $2\frac{1}{2}$ inches above a *fixed mark* on Waterloo Bridge ; or "above the mean level of the sea (presumed about) 95 feet." The discordance between the 81 feet and the 100 feet is easily accounted for by the fact that

the old barometer, prior to 1823, was fixed up in the Council-room of the Society, or the contiguous ante-room : but when Mr. Daniel's barometer was finished, at the end of the year 1822, it was fixed up in the closet adjoining the library, on the floor which is immediately *over* the Council-room ; the assumed difference in the elevation of the two floors (namely, 19 feet) having since been ascertained to be correct.

With respect to the new reference of altitude, namely, the fixed *mark* at Waterloo Bridge, much doubt has frequently been expressed about its existence, since no person had been able to discover it. The fact is that there is no *mark*, in the common acceptation of the term ; but the intended reference is nevertheless more conspicuous, more durable, and more convenient than any mark that could have been inscribed by hands. This standard mark, or level, was fixed on by Mr. Bevan in the year 1827, at the request of the Council of this Society : and it is the surface of the granite pedestal at the base of the columns, at the north abutment of the bridge, and on the eastern side ; which is about 5 feet above the lowest platform, or landing, at the stairs. Nothing therefore was wanting but the difference of level between this mark and the one made by Capt. Lloyd at London Bridge, the height of which above the mean level of the sea had been determined by him. This has been recently done by Sir John Rennie, at the request also of the Council : and the result of the whole is, that the cistern of the barometer is 97 feet above the mean level of the sea.

The author concludes his paper with some remarks on the propriety of the position of the several meteorological instruments of the Society. With respect to the *barometer*, he says he is not aware that any objection can be offered ; and as to the *hygrometer*, the observations have been found, by recent trials, not to differ materially from some expressly made in another position, at King's College, which was considered to be more favourable for such experiments. It therefore only remains to speak of the external *thermometer* and of the *rain-gauge* ; of which all that can be said on the subject would be merely a repetition of what was justly said sixty years ago by Mr. Cavendish on a similar occasion (Philosophical Transactions, 1776), namely, " that, on the whole, the situation is not altogether such as could be wished, but is the *best* the house affords."

November 23, 1837.

FRANCIS BAILY, Esq., V.P. and Treasurer, in the Chair.

The following gentlemen were, by ballot, elected Auditors of the Treasurer's accounts, on the part of the Society, viz. John Frederick Daniell, Esq. ; Sir Philip Grey Egerton, Bart. ; Davies Gilbert, Esq. ; and Stephen Peter Rigaud, Esq.

Frederick William Mullins, Esq., was balloted for, but not elected into the Society.

" Magnetical Observations made in the West Indies, on the Coasts